REMARKS

Prior to the present amendment and response, claims 28-31 were pending in the present application. By the present amendment and response, independent claims 28-31 have been amended to overcome the Examiner's objections. Thus, claims 28-31 remain in the present application. Reconsideration and allowance of pending claims 28-31 in view of the above amendments and the following remarks are requested.

A. Rejection of Claims 28-31 under 35 USC §102(e)

The Examiner has rejected claims 28-31 under 35 USC §102(e) as being anticipated by U.S. patent number 6,271,127 B1 to Liu et al. (hereinafter "Liu"). For the reasons discussed below, Applicants respectfully submits that the present invention, as defined by amended independent claims 28-31, is patentably distinguishable over Liu.

The present invention, as defined by amended independent claim 28, recites, among other things, covering a first area of a dielectric layer, where the dielectric layer has a first dielectric constant, exposing a second area in the dielectric layer to a dielectric conversion source so as to increase the first dielectric constant of the dielectric layer in the second area to a second dielectric constant, and etching a plurality of capacitor trenches in the second area in the dielectric layer. As taught in the present application, a first area of a dielectric layer is covered, for example, with photoresist, to prevent the first area of the dielectric from being exposed to a dielectric conversion source while a second are of the same dielectric is exposed to the dielectric conversion source. The dielectric

conversion source might comprise, for example, E-beams, I-beams, an amine based chemical, or an oxygen plasma.

As disclosed in the present application, due to the exposure to the dielectric conversion source, the second area of the dielectric layer, which initially had a first dielectric constant, now has a second dielectric constant that is greater than the first dielectric constant. However, the dielectric constant of the unexposed first area of the dielectric layer remains substantially unchanged due to the fact that it was covered and therefore unexposed. Advantageously, by converting the dielectric constant of a second area of a dielectric to a higher dielectric constant, the present invention achieves an increase in capacitance in the second area of the dielectric, while a covered first area of the dielectric remains at a relatively low capacitance. As disclosed in the present application, a plurality of capacitor trenches can be etched and filled with metal in the second area in the dielectric layer to form a composite capacitor. Thus, the present invention advantageously achieves a low capacitance area of a dielectric layer (for use in digital circuits) adjacent to a higher capacitance area of the dielectric layer (for use in analog circuits requiring a high capacitance density), which includes a composite capacitor.

In contrast to the present invention as defined by amended independent claim 28, Liu does not teach, disclose, or suggest covering a first area of a dielectric layer, where the dielectric layer has a first dielectric constant, exposing a second area in the dielectric layer to a dielectric conversion source so as to increase the first dielectric constant of the

dielectric layer in the second area to a second dielectric constant, and etching a plurality of capacitor trenches in the second area in the dielectric layer. Liu specifically discloses depositing low dielectric constant material layer 52 over substrate 48 and curing low dielectric constant material layer 52 such that hard mask or etch stop 53 is formed in the topmost layer of low-k material layer 52. See, for example, column 6, lines 36-54 and Figures 4b and 4c of Liu. In Liu, low dielectric constant material layer 52 may be cured by electron beam irradiation or ion implantation. See, for example, Liu, column 6, lines 46-50.

However, Liu fails to teach, disclose, or remotely suggest etching a plurality of capacitor trenches in the second area in the dielectric layer (i.e. the area of the dielectric layer that has been exposed to a dielectric conversion source). Moreover, Liu fails to teach, disclose, or suggest covering a first area of a dielectric layer having a first dielectric constant and exposing a second area of the dielectric layer (i.e. an uncovered area) to a dielectric conversion source such that the dielectric constant of the second area is increased from the first dielectric constant to a second dielectric constant. Without the covering step of the present invention, the dielectric constant of both the first area and the second area would be increased. Indeed, Liu does not even teach increasing a dielectric constant of any part or area of a dielectric. Therefore, Liu does not disclose, teach, or suggest the present invention as defined by amended independent claim 28, nor does Liu achieve some of the advantages of the present invention.

For the foregoing reasons, Applicants respectfully submit that the present invention, as defined by amended independent claim 28, is not taught, disclosed, or suggested by Liu. Thus, amended independent claim 28 is patentably distinguishable over Liu. Amended independent claim 29 recites similar limitations as amended independent claim 28 discussed above. Thus, for the reasons discussed above, amended independent claim 29 is also patentably distinguishable over Liu.

In contrast to the present invention as defined by amended independent claim 30, Liu does not teach, disclose, or suggest covering a first area in a dielectric, where the dielectric has a first dielectric constant, exposing a second area in the dielectric to a dielectric conversion source so as to increase the first dielectric constant of the dielectric in the second area to a second dielectric constant, where covering the first area in the dielectric prevents the first area from being exposed to the dielectric conversion source. As discussed above, Liu fails to teach, disclose, or suggest covering a first area of a dielectric layer having a first dielectric constant and exposing a second area of the dielectric layer (i.e. an uncovered area) to a dielectric conversion source such that the dielectric constant of the second area is increased from the first dielectric constant to a second dielectric constant.

For the foregoing reasons, Applicants respectfully submit that the present invention, as defined by amended independent claim 30, is not taught, disclosed, or suggested by Liu. Thus, amended independent claim 30 is patentably distinguishable over Liu. Amended independent claim 31 recites similar limitations as amended

independent claim 30 discussed above. Additionally, amended independent claim 31 recites a dielectric conversion source comprising oxygen plasma. In Liu, an electron beam or ion implantation can be applied to cure both first and second layers of low dielectric material in the presence of an ambient such as oxygen gas. See, for example, Liu, column 3, lines 24-35. However, Applicant respectfully submits that applying an electron beam or ion implantation in the presence of an ambient such as oxygen gas is not an oxygen plasma dielectric conversion source as specified in amended independent claim 31. Thus, for the reasons discussed above, amended independent claim 31 is also patentably distinguishable over Liu.

B. Rejection of Claims 28-29 under 35 USC §102(e)

The Examiner has rejected claims 28-29 under 35 USC §102(e) as being anticipated by U.S. patent number 5,387,529 to Tomoki Oku (hereinafter "Oku"). For the reasons discussed below, Applicants respectfully submits that the present invention, as defined by amended independent claims 28 and 29, is patentably distinguishable over Oku.

In contrast to the present invention as defined by amended independent claim 28, Oku does not teach, disclose, or suggest covering a first area of a dielectric layer, where the dielectric layer has a first dielectric constant, exposing a second area in the dielectric layer to a dielectric conversion source so as to increase the first dielectric constant of the dielectric layer in the second area to a second dielectric constant, and etching a plurality

of capacitor trenches in the second area in the dielectric layer. Oku relates to a method of producing a fine mask pattern in the production of a compound semiconductor device. See, for example, Oku, column 1, lines 10-13. Oku specifically discloses depositing thermohardening resin film 3 on SiN film 2 and producing photoresist pattern 4 on thermohardening resin film 3. See, for example, column 5, lines 27-30 and 47-48 and Figures 1(a) and 1(b) of Oku. In Oku, an electron beam, an ion beam, or a neutral particle beam is used to irradiate and, thereby, harden thermohardening resin film 3 to form a mask. See, for example, Oku, column 5, lines 51-54 and column 6, lines 31-34. However, Oku fails to teach, disclose, or remotely suggest etching a plurality of capacitor trenches in the second area in the dielectric layer (i.e. the area of the dielectric layer that has been exposed to a dielectric conversion source).

For the foregoing reasons, Applicants respectfully submit that the present invention, as defined by amended independent claim 28, is not taught, disclosed, or suggested by Oku. Thus, amended independent claim 28 is patentably distinguishable over Oku. Amended independent claim 29 recites similar limitations as amended independent claim 28 discussed above. Thus, for the reasons discussed above, amended independent claim 29 is also patentably distinguishable over Oku.

C. **Conclusion**

Based on the foregoing reasons, the present invention, as defined by amended independent claims 28-31, is patentably distinguishable over the art cited by the

Examiner. Thus, claims 28-31 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early Notice of Allowance for all claims 28-31 pending in the present application is respectfully requested.

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Respectfully Submitted,
FARJAMI & FARJAMI LLP

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Michael Farjami, Esq.
Reg. No. 38,135

FARJAMI & FARJAMI LLP
26522 La Alameda Ave., Suite 360
Mission Viejo, California 92691
Telephone: (949) 282-1000
Facsimile: (949) 282-1002

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